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EVALUATION OF HEMODYNAMIC RESPONSE DURING LARYNGOSCOPY AND INTUBATION USING MACINTOSH AND C-MAC BLADES OF LAYNGOSCOPE AN OBSERVATIONAL STUDY

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Abstract

Background: The response to stress induced through laryngoscopy and tracheal intubation significantly affects circulatory parameters, leading to issues like tachycardia and hypertension.
Aim: To investigate the influence of laryngoscope type on hemodynamic responses and critical aspects of the intubation procedure.
Methods: ThisProspective, Randomized and controlled study was conducted in the Department of Anesthesiology, Maharishi Markandeshwar Institute of Medical Sciences and Research Mullana Ambala, after obtaining hospital ethical committee approval. Patient's history and clinical examination were reviewed in detail. The Modified MP Score was used to examine airwayconditions. The intubation method, whether with a Macintosh or C-MAC blade, was chosen at random. This complete strategy ensured that anaesthetic was administered in a controlled and safe manner throughout the surgical process. Key physiological parameters to ensure precise anesthesia management and patient safety were employed. This included continuous tracking of HR, SBP and DSB, MAP, RR, and OS. Monitoring occurred at specific time intervals: pre-induction baseline, before laryngoscopy, during laryngoscopy, during intubation (In), and post intubation at 1, 2, 3, 4, and 5 minutes.
Results: There were not any significant variations in age, height, or weight between the two subgroups. The mean surgical length was likewise comparable between the two groups with a p = 0.020. The distinction of ASA scoring in both sets proved to be insignificant. Significant differences in heart rate between Group A and Group B across different stages of intubation were observed. Before intubation, Group A had a higher mean heart rate compared to Group B, and this difference

was statistically significant (p = 0.001). In both groups, blood flow responses to the two procedures utilizing MAC and C-MAC were comparable for those during surgical anesthesia with acceptable amounts of sedation.
Conclusion: We conclude that, hemodynamic responses during laryngoscopy and intubation using Macintosh or C-MAC laryngoscope are same. These findings suggest that both laryngoscopes are equally effective in clinical practice, ensuring similar patient outcomes and hemodynamic stability throughout intubation and recovery periods.

Keywords: Hemodynamic responses, laryngoscopy, General anaesthesia, intubation Macintosh blade, C-MAC blade.

Introduction:

The response to stress induced through laryngoscopy and tracheal intubation significantly affects circulatory parameters, leading to issues like tachycardia and hypertension.[1] This is particularly problematic among individuals at high risk who have conditions such as CAD, AD, high up intracranial force, and CA. It is crucial to minimize these physiological changes, as they can result in severe complications, including left cardiac ischemia, arrhythmias, and ventricular failure, cerebral aneurysm rupture, CH, and breach of cerebral fulfilment. [2]
Innovations in laryngoscope design, such as the Mc Coy blade (a variation of Macintosh blade), and the introduction of video laryngoscopes like the C-MAC, have significantly enhanced the intubation process, contributing to overall patient safety during various medical procedures. [3]
The depth of anesthesia is pivotal for managing awareness and hemodynamic parameters. Indicators concentrated draft involve Loss of LVR, loss of ocular reflex, and corneal reflex. systematically aware during laryngoscopy and intubation can heighten vascular responses, posing potential risks. Monitoring awareness involves observing traditional symptoms such as movement, tachycardia, HTN, PR, lacrimation.[4]
Preventing or reducing the intense sympathoadrenal response triggered by
laryngoscopy and endotracheal intubation is a crucial concern in anesthesia. While medications are commonly used to mitigate this response, Choosing the type of a different intubation laryngoscope is also significant. Diverse laryngoscopes are employed to ease the intubation process and improve the visualization of the vocal cords, particularly in challenging airway situations. These laryngoscopes are designed to provide a better view with Less force was exerted during the procedure, potentially leading to fewer hemodynamic changes. Essentially, selecting the right equipment, like an alternative laryngoscope, can be an important strategy in managing the physiological responses during airway interventions.[5]

Methods:

A Prospective, Randomized, controlled study was conducted in the Department of Anesthesiology, Maharishi Markandeshwar Institute of Medical Sciences and Research Mullana Ambala, after obtaining hospital ethical committee approval.
A pre-operative visit was held the day before surgery, during which each patient's history and clinical examination were reviewed in detail. The Modified MP Score was used to examine airwayconditions. All patients were told to fast (nil per oral, NPO) for 8 hours before surgery. They were premedicated with 150 mg of oral ranitidine at bedtime and in the morning before surgery. Patients were attached to routine monitoring equipment in the operating room, including an ECG and SpO2, and arterial access was established.
Premedication included the intravenous administration of glycopyrrolate 0.1 mg and fentanyl 2 ug/kg before the inaugural.
"For their surgeries, all patients followed a normal anaesthetic regimen. To maximize lung oxygen reserves, preoxygenation was performed evenly for three minutes. Anesthesia was induced with 2 mg/kg of intravenous propofol, which was modified to eliminate the eyelid reflex, suggesting

sufficient depth of anesthesia. Ventilation was then maintained with a 60:40 combination of nitrous oxide (N_2O) and oxygen (O_2). Isoflurane at 1 MAC was used to maintain anesthesia. An intravenous bolus of atracurium at 0.6 mg/kg aided muscle relaxation during intubation. The intubation method, whether with a Macintosh or C-MAC blade, was chosen at random. This complete strategy ensured that anaesthetic was administered in a controlled and safe manner throughout the surgical process."

Following intubation, anesthesia was maintained with a steady combination of nitrous oxide (N_2O) and oxygen (O_2) in a 60:40 ratio, augmented withisoflurane for five minutes. The size of the endotracheal tube was calculatedusing a formula depending on the patient's age, yielding sizes of 7 or 7.5 mm for females and 8 or 8.5 mm for males. The method included detailed documentation of the laryngoscope blade size used, as well as the duration of laryngoscopy and intubation. This systematic method sought to assure appropriate airway management and consistent anaesthetic depth throughout the surgical operation while adhering to established guidelines and standards.

Intubation difficulty was evaluated using the Cormack-Lehane criteria, which categorizes it from grades I to IV. Patients who required several tries at laryngoscopy or intubation, or who exhibited buckling or gasping after the process, had been dropped from the investigation. Surgery or any further manipulations were delayed until the study procedures, including a standardized five-minute post-intubation period, were completed. This approach ensured rigorous assessment of airway management challenges while maintaining patient safety and study integrity.

Throughout the study, we meticulously monitored and documented key physiological parameters to ensure precise anesthesia management and patient safety. This included continuous tracking of HR, SBP and DSB, MAP, RR, and OS. Monitoring occurred at specific time intervals: pre-induction baseline, before laryngoscopy, during laryngoscopy, during intubation (In), and post intubation at 1, 2, 3, 4, and 5 minutes. Additionally, continuous monitoring of end-tidal CO_2, ECG, and SE provided ongoing assessment of respiratory function, cardiac status, and the depth of anesthesia throughout the entire study period. This systematic approach ensured that any deviations from baseline parameters were promptly identified and addressed, contributing to the safe and effective management of anesthesia during the procedure.

Data for the study were collected using a standardized patient data form specifically created for this research. Quantitative variables were summarized using descriptive statistics such as range, mean with ±SD, median with IQR, frequencies, and percentages as appropriate. The consistency of the collection of data was examined using the Kolmogorov-Smirnov test. To collide quantitative variables between different groups in the study, specification data were analysed using Student's t-test, while non-guidelines data were analysed using the Mann-Whitney U test. Categorical variables were differentiate using either the Chi-square (χ^2) test or Fisher's exact test, depending on the expected frequencies. All statistical analyses were conducted using SPSS version 21 for Windows. This statistical software package ensured rigorous and accurate analysis of the collected data, aligning with standard practices in medical research to derive meaningful conclusions from the study findings.

Results:

Patients were comparable with regard to demographic profile [Table 1]

Table 1: Demographic profile among the study population

Variables	C-MAC GROUP Mean ±SD (%)	MACINTOSH GROUPMean ±SD (%)	P Value
Age (years)	49.61±15.03	43.94±13.24	0.080
Weight (kg)	64.58±9.41	63.79±12.98	0.700
Sex M/F	45.5/54.5	57.6/42.4	0.325
ASA I/II	45/55	66.7/33.3	0.083
MPS 1/2/3/4	3/21.2/72.3/3	21.2/78/0/0	0.001

In Group A 28 patients were 1st attempt of intubation and 5 patients with 2 attempts. In Group B 33 patients were 1st attempt of intubation and 0 patients were 2 attempts. The analysis was non-significant in view of no. of attempts of intubation in the patients between two groups [Table 2].

Table 2: No. of attempts

No. of attempts	C-MAC GROU	MACINTOSH GROUP	P Value
1	84.8%	100.0%	0.053
2	15.2	0.0%	

Hemodynamic response in pre-operative period were comparable among the study population. The analysis was non- significant in view of hemodynamic response in pre-operative period in the patients between two groups(p-value-0.364) [Table 3].

Table 3: Comparison of hemodynamic response in pre-operative period

Variables	C-MAC GROUP	MACINTOSH GROUP	P Value
SBP	127.21±6.46	130.18±10.16	0.247
DBP	84.27±5.44	84.21±3.10	0.984
HR	77.70±1.70	77.33±2.37	0.533
SPO_2	99.67±0.65	99.79±0.55	0.364

There was no statistically significant difference between the two groups in terms of Heart Rate during the intra-operative period [Table 4].

Table 4: comparison of hemodynamic response during intra-operative period with respect to heart rate among the study population

Variables	C-MAC GROUP	MACINTOSH GROUP	P Value
Before Intubation	81.64±2.60	78.55±3.99	0.001
Inter Intubation	105.64±10.55	97.70±11.94	0.007
1min_HR	93.55±6.71	89.94±10.16	0.008
2min_HR	91.48±6.06	86.09±7.65	0.000
3min_HR	84.55±15.60	84.39±5.77	0.028
4min_HR	84.00±4.09	82.88±4.35	0.179
5min_HR	82.33±3.19	81.36±3.50	0.215

Group A exhibited a Mean Arterial Pressure (MAP) of 104.18 (SD 17.73), which was significantly different from Group B's mean of 99.91 (SD 7.49), with a p-value of 0.000 [Fig 1].

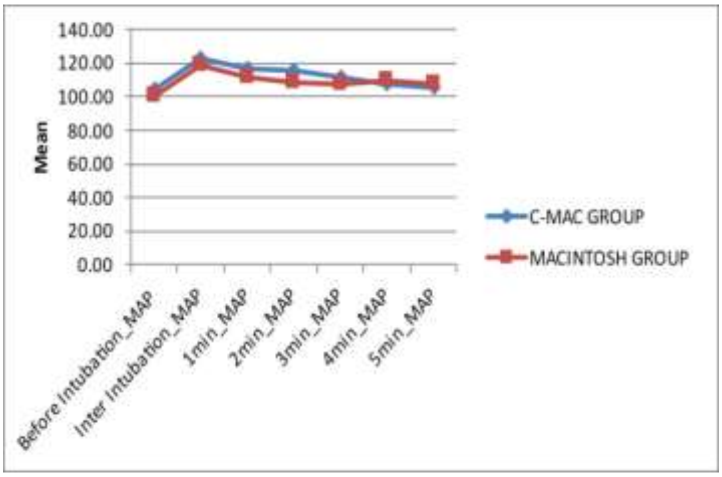

Fig 1.

During the 1st minute of the postoperative period, there was a statistically significant difference in Heart Rate between Group A (mean 85.64, SD 3.76) and Group B (mean 82.55, SD 2.75), with a p value of 0.000 [Fig 2].

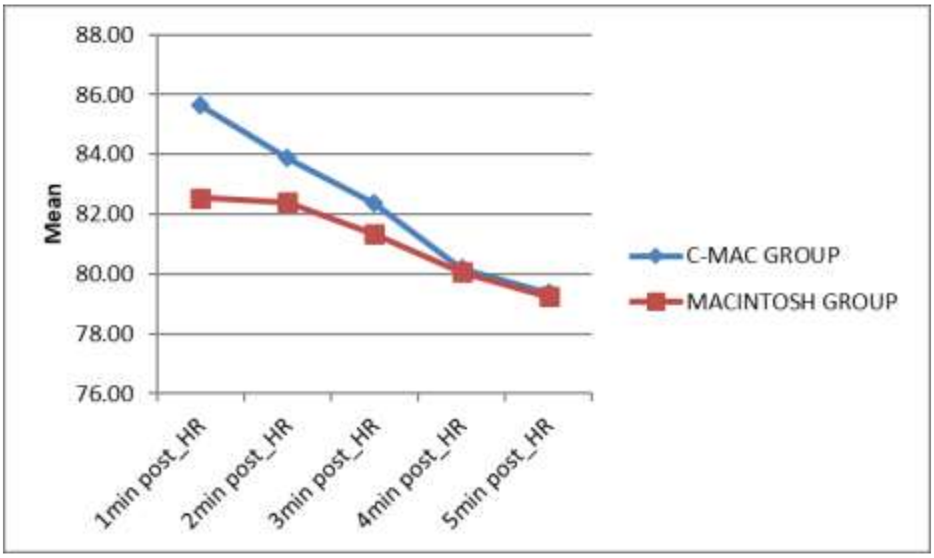

Fig 2.

In the 1st minute after surgery, there was no statistically significant difference in Mean Arterial Pressure (MAP) between Group A (mean 104.61, SD 5.01) and Group B (mean 105.64, SD 7.32), with a p-value of 0.767. Throughout the subsequent intervals of 1min. each (2 min, 3 min, 4 min, 5min) the p-values comparing MAP between Group A and Group B were 0.709, 0.723, 0.629, and 0.501, respectively. There was no discernible change in MAP between Group A and Group B in the early post-operative period. As seen by the corresponding p-values, there was no statistically significant difference in the next minutes (2, 3, 4 and 5) Did not find statistically significant differences in Mean Arterial Pressure (MAP) between Group A and Group B during the postoperative period [Fig 3].

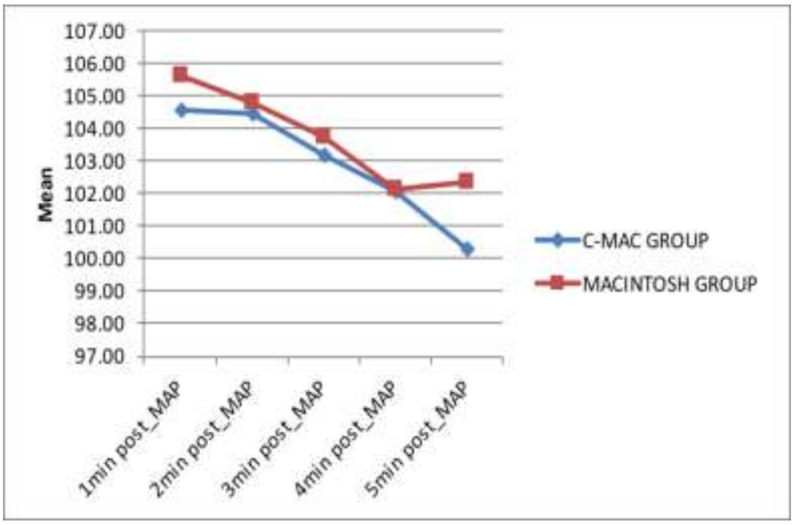

Fig 3.

DISCUSSION

The patient's pre-existing medical issues, the length and complexity of the surgery, and the particular methods and tools the medical team uses all have an impact on the hemodynamic response during laparoscopic surgery and intubation (6) .

The main distinction between the laryngoscope's MAC and C-MAC blades is how they are made and how they help with intubation. To successfully intubate a patient, the Macintosh blade necessitates a more optical excess and frequently further aggressive manipulation of the airway structures. As a result, the body may experience a strong sympathetic reaction that is typified by elevated BP and HR since the intubation procedure is viewed by the body as stressful (6) .

In the present study, there were not any significant variations in age, height, or weight between the two subgroups. The mean surgical length was likewise comparable between the two groups with a p = 0.020. The distinction of ASA scoring in both sets proved to be insignificant.

The research we performed confirmed that in both categories of 33 individuals each, blood flow responses to the two procedures utilizing MAC and C- mac were comparable for those during surgical anesthesia with acceptableamounts of sedation. This finding was similar what was seen by M. Rajasekhar et al. who in this study of 60 patients demonstrated (38) that finding of our study that showed. The data presented compares the heart rates of two groups (Group A and Group B) under different conditions—before and after intubation.

Before intubation and during the first three minutes post-intubation, Group A consistently had higher heart rates compared to Group B, and these differences were statistically significant. However, beyond three minutes post-intubation, the differences in heart rates between the two groups became non significant, indicating that the initial acute responses to intubation varied between the groups but stabilized over time.

Where consistent to what was found by E.P. Mc COY (41) the findings in this study done by us and the volubility of literature (7-18) indicates that the choice of laryngoscopes is not the only assessing factor for the hemodynamic responses. The various other factors that can be decisive, like the depth of anesthesia the technique and skill of intubation which have a significant effect on the hemodynamic response system. Our findings contradict prior research that suggest the C-Mac has a weaker CV response system than the MAC laryngoscope. (1,19)

There are several patients' variables like degree of mouth opening, atlanto occipital extension, mobility of temporomandibular joint, tongue size that effect the degree of difficulty of laryngoscopy and thereby indirectly effect the hemodynamic response to the intubation. (20,21,22)

The differences of our findings to other studies may be due to the fact thatmost significant influence on hemodynamic may arise from the choice of induction regimen and neuro muscular agents. (23) The use of various agents used forblunting the hemodynamic responses are significant factors than

the different laryngoscope blades. Other issues that affect the hemodynamic response is thatprolonged intubation time, increased number of attempts may exacerbate hypertension and tachycardia by augmenting the period to be subject to physical forces executed by laryngoscopes.
In the research we conducted, the rate of intubation sessions was identical inboth categories. There by negating the confounding effect. Various reports thathad demonstrated the effect of Height, Weight, Sex, ASA grading, Mallampati grading and Duration of surgery have been negated by our study. As they were found to be comparable between the two groups.
The limitation in our study where we did not measure to what degree of force
was exerted during laryngoscopy by using the two blades. The depth of anesthesia was not measured during the intra-operative period. Other limitations to the study arterial blood pressure monitoring were not done invasively. Thus,we conclude that keeping in view our observations the use of C-mac and Macintosh do not have any significant difference in hemodynamic response to intubation.

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References:

1. Sarabjit K, Gupta A, Ranjana, Rita. Intubating conditions and stress response to laryngoscopy: Comparison between Macintosh and levering (McCoy's Type) Laryngoscope. J Anaesth Clin Pharmacol 2009;25:333-6.
2. Manish J, Hemanshu P, Dash HH. Comparative evaluation of spectral entropy and bispectral index during propofol/thiopentone anaesthesia in patients with supratentorial tumours - A preliminary study. In J Anaesth 2008;52:175-78.
3. McCoy EP, Mirakher RK. The levering laryngoscope. Anaesthesia 1993;48:516-9.
4. Sandhu K, Dash HH. Awareness during Anaesthesia. In J Anaesth 2009;53:148-57.
5. Paayal Chandrashekar, Sampathila Padmanabha Prospective Randomized Study To Compare Hemodynamic Changes During Mccoy Versus Macintosh Laryngoscopy. Volume : 6 | Issue : 10 | October 2016 | ISSN - 2249-555X | IF : 3.919 | IC Value : 74.50.
6. Rajasekhar M, Yadav M, Kulkarni D, Gopinath R. Comparison of hemodynamic responses to laryngoscopy and intubation using Macintosh or McCoy or C-MAC laryngoscope during uniform depth of anesthesia monitored by entropy. J Anaesthesiol Clin Pharmacol. 2020 Jul-Sep;36(3):391-397. doi: 10.4103/joacp.JOACP_281_19. Epub 2020 Oct 16. PMID: 33487909; PMCID: PMC7812944.
7. Sachidananda R, Umesh G, Shaikh SI. A review of hemodynamic response to the use of different types of laryngoscopes. Anaesth Pain & Intensive Care 2016;20(2):201-208.
8. Paul A, Nathroy A. Comparison of hemodynamic changes during laryngoscopy with McCoy and Macintosh laryngoscopes. J Health Res Rev 2017;4:35-9.
9. Mogahed MM, Elghamri MR, Anwar AG (2017) Comparative Study of Intubation Performance between Macintosh, the Channeled King Vision and the C-MAC D-Blade Videolaryngoscope in Controlled Hypertensive Patients. J Anesth Clin Res 8: 780.
10. Altun D, Ali A, Çamcı E, Özonur A, Seyhan TÖ. Haemodynamic Response to Four Different Laryngoscopes. Turk J Anaesthesiol Reanim. 2018 Dec;46(6):434-440.
11. Elvir-Lazo OL, Yumul R & White PF. (2019) Use of the CMAC Video Laryngoscope for Intubation. Int J Anaesth Res, 2(2): 56-66.
12. Chandra A, Singh M, Agarwal M, Duggal R, Gupta D. Evaluation and comparison of haemodynamic response and ease of intubation between Truview PCD TM, McCOY and Macintosh laryngoscope blades. Indian J Clin Anaesth 2019;6(2):209-14.
13. Aggarwal H, Kaur S, Baghla N, Kaur S. Hemodynamic response toorotracheal intubation: Comparison between Macintosh, McCoy, and C-MAC video laryngoscope. Anesth Essays Res 2019;13:308- 12.

14. Padavarahalli Thammanna P, Marasandra Seetharam K, Channasandra Anandaswamy T, Rath P, Chamanhalli Rajappa G, Joseph J. Comparison of Haemodynamic Response to Intubation with KingVision and C-MAC® Videolaryngoscope in Adults. Arch Anesth & Crit Care. 2020;6(2):65-70.
15. Rajasekhar M, Yadav M, Kulkarni D, Gopinath R. Comparison of hemodynamic responses to laryngoscopy and intubation using Macintosh or McCoy or C-MAC laryngoscope during uniform depth of anesthesia monitored by entropy. J Anaesthesiol Clin Pharmacol. 2020 Jul-Sep;36(3):391-397.
16. Huang P, Zhou R, Lu Z, Hang Y, Wang S, Huang Z. GlideScope versus C-MAC®(D) videolaryngoscope versus Macintosh laryngoscope for double lumen endotracheal intubation in patients with predicted normal airways: a randomized, controlled, prospective trial. BMC Anesthesiol. 2020 May 20;20(1):119.
17. KumariM,Aastha,KumariA,BathlaS,SabharwalN, Das AK. Comparative evaluation of C-MAC videolaryngoscope with Macintosh direct laryngoscope in patients with normal airway predictors. Anesth Essays Res 2022;16:326-30.
18. McCoy EP, Mirakhur RK, Rafferty C, Bunting H, Austin BA. A comparison of the forces exerted during laryngoscopy. The Macintosh versus the McCoy blade. Anaesthesia. 1996Oct;51(10):912-5.
19. McCoy EP, Mirakhur RK, McCloskey BV. A comparison of the stress response to laryngoscopy. The Macintosh versus the McCoy blade. Anaesthesia 1995;50:943-6.
20. BLOCK C, BRECHNER VL. Unusual problems in airway management 11. The influence of the temporomandibular joint, the mandible and associated structures on endotracheal intubation. Anesthesia rind Ancilgesirr 1971; 50 114-23.
21. MALLAMPATI SR, GATT SP, GUCINO LD, DESAI SP, WARAKSA B, FREIBERCER D, LIU PL. A clinical sign to predict dificult intubation: a prospective study. Crinridian Atiuc~st/ic~ti.st'.s Society Journcil 1985; 32: 429-34.
22. Haidry MA, Khan FA. Comparison of hemodynamic response to tracheal intubation with Macintosh and McCoy laryngoscopes. J Anaesthesiol Clin Pharmacol. 2013;29:196–9.
23. BELLHOUSE CP, DORE C. Criteria for estimating likelihood of difficulty of endotracheal intubation with the Macintosh laryngoscope. Anardiesiri rind Intensive Cnre 1988; 16 329-37.